



UNIVERSITI PUTRA MALAYSIA

**GROUNDING THEORY FOR TRANSITION TO
AND ADOPTION OF AGILE SOFTWARE
DEVELOPMENT**

TAGHI JAVDANI GANDOMANI

FSKTM 2014 2



**GROUNDING THEORY FOR TRANSITION TO
AND ADOPTION OF AGILE SOFTWARE
DEVELOPMENT**

TAGHI JAVDANI GANDOMANI

**DOCTOR OF PHILOSOPHY
UNIVERSITI PUTRA MALAYSIA**

2014



**GROUNDING THEORY FOR TRANSITION TO AND ADOPTION OF AGILE
SOFTWARE DEVELOPMENT**

By

TAGHI JAVDANI GANDOMANI

**Thesis Submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in Fulfilment of the
Requirements for the Degree of Doctor of Philosophy**

July 2014

All material contained within the thesis, including without limitation text, logos, icons, photographs and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia

DEDICATION

Dedicated to my late father, God rest his soul, who has been my constant source of inspiration.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

GROUNDING THEORY FOR TRANSITION TO AND ADOPTION OF AGILE SOFTWARE DEVELOPMENT

By

TAGHI JAVDANI GANDOMANI

July 2014

Chairman: Hazura Zulzalil, PhD

Faculty: Computer Science and Information Technology

Successful migration from traditional software development methods to Agile methods, as an organizational mutation, requires enough understanding of Agile transformation process and its related issues. Reviewing the literature revealed that software companies are struggling with many challenges during Agile transition process. However, there was no large-scale research study to elucidate various aspects and dimensions of the transition process. Also, less effort has been devoted to investigate the whole transition process.

A Grounding Theory study with participation of 49 Agile experts from 13 different countries, mostly from USA and West Europe countries, and some from Asia and Australia, has been carried out to investigate the realities of Agile transformation. Adopted research methodology provided a systematic approach to discover various aspect of the transformation through a multi-level data analysis including open coding, selective coding, and theoretical coding. Following a high disciplined approach, various concepts and categories have been identified and finally, the main concern of the participants, known as core category, has been discovered as the theory of Agile transition and adoption comprising four major parts: (1) *Agile Transition Key Prerequisites*, (2) *Agile Transition Challenges*, (3) *Agile Transition Facilitators*, and (4) *Agile Transition and Adoption Framework*.

This study discovered the most important prerequisites that software companies need to provide before starting their transition to Agile approach including having convincing reason for change, defining business values, initial training, etc. Software companies have to do a preparation phase to provide these prerequisites before starting Agile transformation. It also identified the major challenges that software teams and companies are facing with when moving to Agile, including negative human aspects, inadequate and dysfunctional training, technical challenges, etc. These challenges have different roots and acts as impediments to the change. Also, this study discovered various change facilitators, including training, getting buy-in from practitioners, good coaching service, etc. Providing these facilitators help software teams to deal with the transformation challenges and increase chance of

success. Finally, it proposed a substantive framework for transitioning to Agile approach. The proposed framework has particular features, discipline, and activities which promise usefulness for Agile transformation process in software companies regardless of size and project type. This framework particularly aims to promote sustainable change and being Agile instead of doing Agile.

In general, this study developed the theory of Agile transition and adoption and discovered various aspects of the transformation. The findings of this study will serve to inform all software practitioners about transitioning to Agile software development.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

TEORI ASAS PERALIHAN DAN PENERIMAAN KE PEMBANGUNAN PERISIAN *AGILE*

Oleh

TAGHI JAVDANI GANDOMANI

Julai 2014

Pengerusi: Hazura Zulzalil, PhD

Fakulti: Sains Komputer dan Teknologi Maklumat

Berjaya berhijrah dari kaedah pembangunan perisian tradisional kepada kaedah *Agile*, sebagai sesebuah organisasi yang ingin berubah, memerlukan kefahaman yang cukup berkenaan proses transformasi *Agile* dan isu-isu yang berkaitan. Kajian literatur mendedahkan bahawa syarikat-syarikat perisian bergelut dengan pelbagai cabaran semasa proses peralihan *Agile*. Walau bagaimanapun, tiada kajian penyelidikan berskala besar untuk menjelaskan pelbagai aspek dan dimensi proses peralihan. Juga, tidak banyak usaha telah ditumpukan untuk mengkaji proses peralihan secara menyeluruh.

Satu kajian teori asas dengan penyertaan 49 pakar *Agile* dari 13 negara yang berbeza, kebanyakannya dari Amerika Syarikat dan negara-negara Eropah Barat, dan beberapa dari Asia dan Australia, telah dijalankan untuk mengkaji realiti transformasi *Agile*. Kaedah penyelidikan yang diguna pakai ini menyediakan kaedah yang sistematik untuk menerokai pelbagai aspek transformasi melalui analisis data pelbagai peringkat termasuk pengekodan terbuka, pengekodan terpilih, dan pengekodan teori. Berikutan pendekatan yang berdisiplin tinggi, pelbagai konsep dan kategori telah dikenal pasti dan akhirnya, kebimbangan utama para peserta, yang dikenali sebagai kategori teras, telah ditemui sebagai teori peralihan dan penerimaan *Agile* yang terdiri daripada empat bahagian utama: (1) *Prasyarat Utama Peralihan Agile*, (2) *Cabaran Peralihan Agile*, (3) *Pemudah cara Peralihan Agile*, dan (4) *Rangka Kerja Peralihan dan Penerimaan Agile*.

Kajian ini mendapati prasyarat utama peralihan *Agile* perlu ada sebelum memulakan peralihan *Agile* termasuk mempunyai sebab yang meyakinkan untuk perubahan, menentukan nilai-nilai perniagaan, latihan awal, dan lain-lain. Syarikat-syarikat perisian perlu melaksanakan fasa persediaan untuk menyediakan prasyarat ini sebelum memulakan transformasi *Agile*. Kajian juga mengenal pasti cabaran utama yang dihadapi oleh pasukan perisian dan syarikat-syarikat apabila beralih ke *Agile*, termasuk aspek-aspek negatif manusia, latihan yang tidak mencukupi dan tidak berfungsi, cabaran teknikal, dan lain-lain. Cabaran-cabaran ini mempunyai latar belakang yang berbeza dan menjadi halangan kepada perubahan. Selain itu, kajian ini mengenalpasti pelbagai pemudah cara perubahan, termasuk latihan, melibatkan

pengamal, perkhidmatan bimbingan yang baik, dan lain-lain. Penyediaan pemudah cara ini membantu pasukan perisian untuk menangani cabaran transformasi dan meningkatkan peluang untuk berjaya. Akhirnya, kajian ini mencadangkan rangka kerja yang substantif peralihan kepada pendekatan *Agile*. Rangka kerja yang dicadangkan mempunyai ciri-ciri tertentu, disiplin, dan aktiviti-aktiviti yang menjanjikan kegunaan proses transformasi *Agile* dalam syarikat-syarikat perisian tanpa mengira saiz dan jenis projek. Rangka kerja ini bertujuan terutamanya untuk menggalakkan perubahan yang berterusan dan menjadi *Agile* daripada melakukan *Agile*.

Secara umum, kajian ini membina teori peralihan dan penerimaan *Agile* dan menerokai pelbagai aspek transformasi. Hasil kajian ini akan memaklumkan kepada semua pengamal perisian mengenai peralihan kepada pembangunan perisian *Agile*.

ACKNOWLEDGEMENTS

"They replied, 'we have no knowledge except that which you have taught us. You are indeed the knowing, the wise.' " AL-BAQARA-Ayah 32.

I would like appreciate the professional and friendly support of my supervisor, Dr. Hazura who was always available and push me forward. I am indebted her for her continuous support and commitment throughout my study. Also, I would to express my deepest gratitude to my supervisory committee members, Prof. Azim, Assoc. Prof. Dr. Abu Bakar, and Dr. Khaironi. Your time, advice and support have been invaluable and so helpful to me in various stages of my work. I am particularly grateful to Prof. Azim for his helpful comments, fruitful discussions, invaluable guidance, and great suggestions to this research study.

I wish to extend my gratitude to all the participants of this study who were willing to share their time and stories of their experiences. Also, many thanks go to the anonymous reviewers of journals and conferences who contributed to this research by their helpful comments. Particularly, I would like to thank Prof. Hossein Saiedian, Johanna Rothman, Ron Jeffries, Andrew Pham, Evan Laybourn, and Ari Tanninen who patiently helped me during my research and for theory evaluation. Also, my thanks go to the approved representatives of Glaser, Dr. Alvita Nathaniel, Dr. Helen Scott, Dr. Tina Johnston, Dr. Lowe, and Dr. Gynnild, who directed me in all stages of Grounded Theory.

Last but not least, I would like to express my sincere gratitude to my wife Mina for always supporting me in what I wanted to achieve against all obstacles, and to my Son Mehrpuya who have tolerated being away from me for several years without any complaint. Also, my thanks go to my mother, brothers, and sisters; especially my brother, Javad who always has been a real supporter of me all the time.

I certify that a Thesis Examination Committee has met on 21 July 2014 to conduct the final examination of Taghi Javdani Gandomani on his thesis entitled "Grounded Theory for Transition to and Adoption of Agile Software Development" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

Masrah Azrifah binti Azmi Murad, PhD

Associate Professor

Faculty of Computer Science and Information Technology

Universiti Putra Malaysia

(Chairman)

Rusli bin Hj Abdullah, PhD

Associate Professor

Faculty of Computer Science and Information Technology

Universiti Putra Malaysia

(Internal Examiner)

Shamsul Sahibuddin, PhD

Professor

University Technology Malaysia

Malaysia

(External Examiner)

Volker Gruhn, PhD

Professor

University of Duisburg-Essen

Germany

(External Examiner)



NORITAH OMAR, PhD

Associate Professor and Deputy Dean

School of Graduate Studies

Universiti Putra Malaysia

Date: 18 August 2014

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Hazura Zulzalil, PhD

Senior Lecturer

Faculty of Computer Science and Information Technology

University Putra Malaysia

(Chairman)

Abdul Azim Abd. Ghani, PhD

Professor

Faculty of Computer Science and Information Technology

University Putra Malaysia

(Member)

Abu Bakar Md. Sultan PhD

Associate Professor

Faculty of Computer Science and Information Technology

University Putra Malaysia

(Member)

Khaironi Yatim Shairf, PhD

Senior Lecturer

Faculty of Computer Science and Information Technology

University Putra Malaysia

(Member)

BUJANG BIN KIM HUAT, PhD

Professor and Dean

School of Graduate Studies

Universiti Putra Malaysia

Date:

DECLARATION

Declaration by graduate student

I hereby confirm that:

- x this thesis is my original work;
- x quotations, illustrations and citations have been duly referenced;
- x this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- x intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- x written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- x there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: _____ Date: _____

Name and Matric No.: Taghi Javdani Gandomani, GS32045

Declaration by Members of Supervisory Committee

This is to confirm that:

- x the research conducted and the writing of this thesis was under our supervision;
- x Supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____

Name of
Chairman of
Supervisory
Committee: Hazura Zulzalil, PhD

Signature: _____

Name of
Member of
Supervisory
Committee: Abdul Azim Abd. Ghani, PhD, Professor

Signature: _____

Name of
Member of
Supervisory
Committee: Abu Bakar Md. Sultan, PhD, Assoc. Professor

Signature: _____

Name of
Member of
Supervisory
Committee: Khaironi Yatim Sharif, PhD

TABLE OF CONTENTS

ABSTRACT	Page i
ABSTRAKT	iii
ACKNOWLEDGEMENTS	v
APPROVAL	vi
DECLARATION	viii
LIST OF TABLES	xiv
LIST OF FIGURES	xv
LIST OF ABBREVIATIONS	xvi

CHAPTER

1	INTRODUCTION	1
1.1	Background	1
1.2	Problem Statement	2
1.3	Research Objectives	4
1.4	Scope and Context of the Research	4
1.5	Contributions of the Research	4
1.6	Thesis Structure	5
2	LITERATURE REVIEW	9
2.1	Overview	9
2.2	Traditional Software Development	9
2.2.1.	The Waterfall Model	10
2.2.2.	The Spiral Model	11
2.2.3.	The Unified Process / Rational Unified Process Model	12
2.2.4.	Strengths and Weaknesses of implementation of traditional methods	13
2.3	Agile Software Development (ASD)	14
2.3.1.	Scrum	16
2.3.2.	Extreme Programming (XP)	19
2.3.3.	Lean and Kanban Software Development	23
2.3.4.	Other Agile Methods	25
2.4	Agile Versus Traditional Software Development	27
2.5	Agile Transition and Adoption	29
2.5.1.	Challenges in Agile Transformation	29
2.5.2.	Agile Transition and Adoption Models or Frameworks	31
2.5.3.	Transition and Adoption: Method or Practice	33
2.6	Summary	35
3	RESEARCH METHODOLOGY	36
3.1	Overview	36
3.2	Research Methods	36
3.3	Why Grounded Theory?	37
3.4	GT Studies in Agile Context	38
3.5	Research Perspectives	39
3.6	Role of the Researcher	40
3.7	Grounded Theory	40

3.7.1.	Identification of Participants' Concern	41
3.7.2.	Minor Literature Review	42
3.7.3.	Data Collection	44
3.7.4.	Data Analysis	49
3.7.5.	Theoretical Memoing (Memoing)	54
3.7.6.	Sorting	55
3.7.7.	Major Literature Review	55
3.7.8.	Theoretical Coding	56
3.7.9.	Write – up	57
3.7.10.	Evaluating a Grounded Theory	57
3.8	Discussion	63
3.9	Summary	64
4	GROUNDING THEORY OF AGILE TRANSITION AND ADOPTION PROCESS	65
4.1	Overview	65
4.2	Agile Transition Related Issues	65
4.3	Agile Transition and Adoption process: The Core Category	67
4.4	Agile Transition Key prerequisites	69
4.5	Agile Transition Challenges	70
4.6	Agile Transition Facilitators	70
4.7	Agile Transition and Adoption Framework	70
4.8	Summary	71
5	AGILE TRANSITION KEY PREREQUISITES	72
5.1	Overview	72
5.2	Agile Transformation Key Prerequisites	72
5.2.1.	Having Convincing Reasons for Change	73
5.2.2.	Defining Business Goals	74
5.2.3.	People Buy-in	75
5.2.4.	Initial Training	77
5.2.5.	Pilot Project Selection	79
5.2.6.	Pre-Start Assessment	85
5.2.7.	Team Set Up	86
5.3	Discussion	89
5.3.1.	Having Convincing Reasons for Change	89
5.3.2.	Defining Business Goals	89
5.3.3.	People Buy-in	90
5.3.4.	Initial Training	90
5.3.5.	Pilot Project Selection	91
5.3.6.	Pre-Start Assessment	92
5.3.7.	Team Set Up	92
5.4	Implications for Theory	93
5.5	Implications for Practice	94
5.6	Summary	94
6	AGILE TRANSITION CHALLENGES	96
6.1	Overview	96
6.2	Agile Transition Challenges and Issues	96
6.3	Negative Human Aspects	97
6.3.1.	Impediments to Agile Transition	97

6.3.2.	People's Perceptions about the Change Process	101
6.3.3.	Accelerating the Change	105
6.4	Inadequate and Dysfunctional Training	106
6.4.1.	Context	106
6.4.2.	The Causes of Inadequate and Dysfunctional Training	106
6.4.3.	Consequences of Inadequate and Dysfunctional Training	111
6.4.4.	Conditions	115
6.4.5.	Contingencies	117
6.4.6.	Covariance	120
6.5	Customer Issues	121
6.6	Technical Issues	122
6.7	Discussion	122
6.7.1.	Negative Human Aspects in Agile Transition	123
6.7.2.	Inadequate and Dysfunctional Training	125
6.8	Implications for Theory	126
6.8.1.	Human Aspects in Agile Transition	126
6.8.2.	Inadequate and Dysfunctional Training	126
6.9	Implications for Practice	127
6.9.1.	Human Aspects in Agile Transition	127
6.9.2.	Inadequate and Dysfunctional Training	128
6.10	Summary	129
7	AGILE TRANSITION FACILITATORS	131
7.1	Overview	131
7.2	Facilitators of Agile Transition	131
7.2.1.	Training	132
7.2.2.	Management Buy-in	133
7.2.3.	Team Members Buy-in	134
7.2.4.	Good Coaching and Mentoring	135
7.2.5.	Right People Selection and Empowering Team	137
7.2.6.	Continuous Meetings and Negotiations	138
7.2.7.	Agile Champions	139
7.2.8.	Incentive Factors	140
7.3	Discussion	141
7.3.1.	Training	141
7.3.2.	Management Buy-in	142
7.3.3.	Team Members Buy-in	142
7.3.4.	Good Coaching and Mentoring	142
7.3.5.	Right People Selection and Empowering Team	143
7.3.6.	Continuous Meetings and Negotiations	143
7.3.7.	Agile Champions	144
7.3.8.	Incentive Factors	144
7.4	Implications for Theory	145
7.5	Implications for Practice	145
7.6	Summary	146
8	SUBSTANTIVE AGILE TRANSITION AND ADOPTION FRAMEWORK	147

8.1	Overview	147
8.2	Agile Transition and Adoption Framework	147
	8.2.1. Agile Transition and Adoption Framework Structural Characteristics	147
	8.2.2. Agile Transition and Adoption Key Activities	152
8.3	Discussion	158
	8.3.1. Transition Stepwise Model	158
	8.3.2. Comparison with the Related Works	159
8.4	Implications for Theory	161
8.5	Implications for Practice	162
	8.5.1. Importance of the Preparation Phase	162
	8.5.2. Modelling Agile Transition and Adoption	162
	8.5.3. Proposing a Practical Agile Transition and Adoption	163
8.6	Summary	164
9	THEORY EVALUATION	166
9.1	Overview	166
9.2	Theory Evaluation Based on the Glaser's Approach	166
9.3	Theory Evaluation Based on the Weber's Approach	168
	9.3.1. Parts	168
	9.3.2. Whole	171
9.4	Theory Evaluation Based on the Lincoln and Guba's Approach	173
9.5	On the Sidelines of the Research	174
9.6	Summary	175
10	CONCLUSION	176
10.1	Overview	176
10.2	Research Contributions	176
	10.2.1. Agile Transition Prerequisites: Preparation Phase	176
	10.2.2. Agile Transition Challenges	177
	10.2.3. Agile Transition Facilitators	178
	10.2.4. Agile Transition and Adoption Framework	178
	10.2.5. Implications for Theory	178
	10.2.6. Implications for Practice	179
10.3	Limitations and Threats to Validity	180
10.4	Future Work	182
	REFERENCES	184
	APPENDICES	210
	BIODATA OF STUDENT	214
	LIST OF PUBLICATIONS	215